CLAIMS

We claim:

1. An integrated thermal management system comprising;

a refrigeration subsystem having a refrigerant and multiple components,

an electrical subsystem having multiple components,

an electronic control subsystem having multiple components,

wherein said refrigeration subsystem is in thermal communication with at least one of the components of the electrical subsystem and at least one of the components of the electronic control subsystem,

wherein said electrical subsystem is in thermal communication with at least one of the components of the refrigeration subsystem and in electronic communication with at least one of the components of said electronic control subsystem, and

wherein said electronic control subsystem is in electronic communication with at least one of the components of the electrical subsystem and at least one of the components of the refrigeration system.

2. The integrated thermal management system of Claim 1 wherein said thermal communication is direct refrigerant contact.

3. The integrated thermal management system of Claim 1 wherein said electronic communication further comprises digital signal processing signals.

4. The integrated thermal management system of Claim 1 wherein said refrigeration subsystem further comprises at least one device selected from the group consisting of refrigerant compressors, refrigerant control devices, refrigerant reservoirs, refrigerant condensers, refrigerant evaporators, and heat exchangers, each device responsive to said electronic control subsystem.

5. The integrated thermal management system of Claim 1 wherein said electrical subsystem further comprises at least one device selected from the group consisting of inverters, traction motors, refrigerant compressor motors, fuel cells, auxiliary converters, gate drivers, and power electronic devices, each device responsive to said electronic control subsystem.

6. The integrated thermal management system of Claim 5 wherein said refrigerant evaporates in direct contact with the windings and core of said traction motors.

7. The integrated thermal management system of Claim 5 wherein said refrigerant evaporates in indirect contact with the windings and core of said traction motors.

8. The integrated thermal management system of Claim 5 wherein said refrigerant evaporates in indirect contact with vehicle transmission oil.

9. The integrated thermal management system of Claim 5 wherein said inverter is a four leg inverter using zero-sequence components to drive at least one motor selected from the group consisting of induction and brushless DC motors.

10. The integrated thermal management system of Claim 5 wherein said inverter is a three and one-half leg inverter using zero-sequence components to drive at least one brushless DC motor.

11. The integrated thermal management system of Claim 1 wherein said electronic control subsystem further comprises at least one device selected from the group consisting of digital signal processors, inverter controllers, sensors, and control wiring.

12. The integrated thermal management system of Claim 11 wherein said sensors are selected from the group consisting of pressure sensors, temperature sensors, current sensors, and voltage sensors.

13. The integrated thermal management system of Claim 1 wherein said electronic control subsystem controls the refrigeration subsystem devices and electrical subsystem devices within set limits of temperature, pressure, current, and voltage.

14. A method of managing the thermal environment of a vehicle comprising;

providing a refrigeration subsystem having a refrigerant and multiple components,

providing an electrical subsystem having multiple components,

providing an electronic control subsystem having multiple components,

wherein said refrigeration subsystem is in thermal communication with at least one of the components of the electrical subsystem and at least one of the components of the electronic control subsystem,

wherein said electrical subsystem is in thermal communication with at least one of the components of the refrigeration subsystem and in electronic communication with at least one of the components of said electronic control subsystem, and

wherein said electronic control subsystem is in electronic communication with at least one of the components of the electrical subsystem and at least one of the components of the refrigeration system.

15. The method of Claim 14 wherein said thermal communication is direct refrigerant contact.

16. The method Claim 14 wherein said electronic communication further comprises digital signal processing signals.

17. The method Claim 14 wherein said refrigeration subsystem further comprises at least one device selected from the group consisting of refrigerant compressors, refrigerant control devices, refrigerant reservoirs, refrigerant condensers, refrigerant evaporators, and heat exchangers, each device responsive to said electronic control subsystem.

18. The method of Claim 14 wherein said electrical subsystem further comprises at least one device selected from the group consisting of inverters, traction motors, refrigerant compressor motors, fuel cells, auxiliary converters, gate drivers, and power electronic devices, each device responsive to said electronic control subsystem.

19. The method of Claim 18 wherein said refrigerant evaporates in direct contact with the windings and core of said traction motors.

20. The method of Claim 18 wherein said refrigerant evaporates in indirect contact with the windings and core of said traction motors.

21. The method of Claim 18 wherein said refrigerant evaporates in indirect contact with vehicle transmission oil.

22. The method of Claim 18 wherein said inverter is a four leg inverter using zero-sequence components to drive at least one motor selected from the group consisting of induction and brushless DC motors.

23. The method of Claim 18 wherein said inverter is a three and one-half leg inverter using zero-sequence components to drive at least one brushless DC motor.

24. The method of Claim 14 wherein said electronic control subsystem further comprises at least one device selected from the group consisting of digital signal processors, inverter controllers, sensors, and control wiring.

25. The method of Claim 24 wherein said sensors are selected from the group consisting of pressure sensors, temperature sensors, current sensors, and voltage sensors.

26. The method of Claim 14 wherein said electronic control subsystem controls the refrigeration subsystem devices and electrical subsystem devices within set limits of temperature, pressure, current, and voltage.